

WHAT IS CLAIMED IS:

1. A thin film device comprising: a metal sulfide layer formed on a single crystal silicon substrate by epitaxial growth; and a compound thin film with ionic bonding, which is formed on the metal sulfide layer by epitaxial growth.
2. A thin film device comprising: a metal sulfide layer formed on a single crystal silicon substrate by epitaxial growth; and at least two compound thin films with ionic bonding, which are formed on the metal sulfide layer by epitaxial growth.
3. The thin film device as claimed in claim 1, wherein said metal sulfide layer is composed of one of a manganese sulfide (MnS), magnesium sulfide (MgS), and calcium sulfide (CaS).
4. The thin film device as claimed in claim 2, wherein said metal sulfide layer is composed of one of a manganese sulfide (MnS), magnesium sulfide (MgS), and calcium sulfide (CaS).
5. The thin film device as claimed in claim 1, wherein said metal sulfide layer is composed of a material whose chemical formula is given by $Zn(1-x)M_xS_y$, in which part of zinc of zinc sulfide (ZnS) is substituted by another metal

(M), where x and y are values between 0 and 1.

6. The thin film device as claimed in claim 2, wherein
said metal sulfide layer is composed of a material whose
5 chemical formula is given by $Zn(1-x)M_xS_y$, in which part of
zinc of zinc sulfide (ZnS) is substituted by another metal
(M), where x and y are values between 0 and 1.

7. The thin film device as claimed in claim 5, wherein
10 said metal sulfide layer is composed of zinc manganese
sulfide ((Zn, Mn)S).

8. The thin film device as claimed in claim 6, wherein
said metal sulfide layer is composed of zinc manganese
15 sulfide ((Zn, Mn)S).

9. The thin film device as claimed in claim 1, wherein
said metal sulfide layer is composed of a material whose
chemical formula is given by $Zn(1-x)(M, N, \dots)_xS_y$, in which
20 part of zinc of zinc sulfide (ZnS) is substituted by other
metals (M, N, ...), where x and y are values between 0 and
1.

10. The thin film device as claimed in claim 2, wherein
25 said metal sulfide layer is composed of a material whose
chemical formula is given by $Zn(1-x)(M, N, \dots)_xS_y$, in which
part of zinc of zinc sulfide (ZnS) is substituted by other

metals (M, N, ...), where x and y are values between 0 and 1.

11. The thin film device as claimed in claim 1, further
5 comprising a platinum group layer formed between said metal sulfide layer and said compound thin film by epitaxial growth.

12. The thin film device as claimed in claim 2, further
10 comprising a platinum group layer formed between said metal sulfide layer and said compound thin film by epitaxial growth.

13. The thin film device as claimed in claim 11, wherein
15 a metal of said platinum group layer is one of rhodium, iridium, palladium and platinum or an alloy of them, and said platinum group layer is composed of a single layer or multi-layer thin film thereof.

20 14. The thin film device as claimed in claim 12, wherein a metal of said platinum group layer is one of rhodium, iridium, palladium and platinum or an alloy of them, and said platinum group layer is composed of a single layer or multi-layer thin film thereof.

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15. The thin film device as claimed in claim 1, wherein said compound thin film is composed of a metal nitride thin

film.

16. The thin film device as claimed in claim 2, wherein
said compound thin film is composed of a metal nitride thin
5 film.

17. The thin film device as claimed in claim 3, wherein
said compound thin film is composed of a metal nitride thin
film.

10 18. The thin film device as claimed in claim 4, wherein
said compound thin film is composed of a metal nitride thin
film.

15 19. The thin film device as claimed in claim 5, wherein
said compound thin film is composed of a metal nitride thin
film.

20 20. The thin film device as claimed in claim 6, wherein
said compound thin film is composed of a metal nitride thin
film.

21. The thin film device as claimed in claim 7, wherein
said compound thin film is composed of a metal nitride thin
25 film.

22. The thin film device as claimed in claim 8, wherein

said compound thin film is composed of a metal nitride thin film.

23. The thin film device as claimed in claim 9, wherein
5 said compound thin film is composed of a metal nitride thin film.

24. The thin film device as claimed in claim 10, wherein
10 said compound thin film is composed of a metal nitride thin film.

25. The thin film device as claimed in claim 11, wherein
said compound thin film is composed of a metal nitride thin film.

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26. The thin film device as claimed in claim 12, wherein
said compound thin film is composed of a metal nitride thin film.

20 27. The thin film device as claimed in claim 13, wherein
said compound thin film is composed of a metal nitride thin film.

28. The thin film device as claimed in claim 14, wherein
25 said compound thin film is composed of a metal nitride thin film.

29. The thin film device as claimed in claim 1, wherein said compound thin film is composed of a metal oxide thin film.
- 5 30. The thin film device as claimed in claim 2, wherein said compound thin film is composed of a metal oxide thin film.
- 10 31. The thin film device as claimed in claim 3, wherein said compound thin film is composed of a metal oxide thin film.
- 15 32. The thin film device as claimed in claim 4, wherein said compound thin film is composed of a metal oxide thin film.
- 20 33. The thin film device as claimed in claim 5, wherein said compound thin film is composed of a metal oxide thin film.
- 25 34. The thin film device as claimed in claim 6, wherein said compound thin film is composed of a metal oxide thin film.
35. The thin film device as claimed in claim 7, wherein said compound thin film is composed of a metal oxide thin film.

36. The thin film device as claimed in claim 8, wherein said compound thin film is composed of a metal oxide thin film.

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37. The thin film device as claimed in claim 9, wherein said compound thin film is composed of a metal oxide thin film.

10 38. The thin film device as claimed in claim 10, wherein said compound thin film is composed of a metal oxide thin film.

15 39. The thin film device as claimed in claim 11, wherein said compound thin film is composed of a metal oxide thin film.

20 40. The thin film device as claimed in claim 12, wherein said compound thin film is composed of a metal oxide thin film.

25 41. The thin film device as claimed in claim 13, wherein said compound thin film is composed of a metal oxide thin film.

42. The thin film device as claimed in claim 14, wherein said compound thin film is composed of a metal oxide thin

film.

43. The thin film device as claimed in claim 1, wherein
said compound thin film is composed of a metal sulfide thin
5 film.

44. The thin film device as claimed in claim 2, wherein
said compound thin film is composed of a metal sulfide thin
film.

10 45. The thin film device as claimed in claim 3, wherein
said compound thin film is composed of a metal sulfide thin
film.

15 46. The thin film device as claimed in claim 4, wherein
said compound thin film is composed of a metal sulfide thin
film.

20 47. The thin film device as claimed in claim 5, wherein
said compound thin film is composed of a metal sulfide thin
film.

25 48. The thin film device as claimed in claim 6, wherein
said compound thin film is composed of a metal sulfide thin
film.

49. The thin film device as claimed in claim 7, wherein

said compound thin film is composed of a metal sulfide thin film.

50. The thin film device as claimed in claim 8, wherein
5 said compound thin film is composed of a metal sulfide thin film.

51. The thin film device as claimed in claim 9, wherein
said compound thin film is composed of a metal sulfide thin
10 film.

52. The thin film device as claimed in claim 10, wherein
said compound thin film is composed of a metal sulfide thin
film.

15 53. The thin film device as claimed in claim 11, wherein
said compound thin film is composed of a metal sulfide thin film.

20 54. The thin film device as claimed in claim 12, wherein
said compound thin film is composed of a metal sulfide thin film.

55. The thin film device as claimed in claim 13, wherein
25 said compound thin film is composed of a metal sulfide thin film.

56. The thin film device as claimed in claim 14, wherein said compound thin film is composed of a metal sulfide thin film.

5 57. A thin film device comprising: a manganese sulfide (MnS) layer formed on a single crystal silicon (100) substrate by epitaxial growth; and an aluminum nitride (AlN) layer formed on said manganese sulfide layer by epitaxial growth, said aluminum nitride (AlN) layer having a $(11\bar{2}0)$ surface as its top surface.
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58. The thin film device as claimed in claim 57, further comprising a compound thin film with ionic bonding, which has a $(11\bar{2}0)$ surface formed by epitaxial growth as its top surface, and is formed on said aluminum nitride (AlN) layer
15 having the $(11\bar{2}0)$ surface as its top surface, or via another intermediate layer.

59. The thin film device as claimed in claim 58, wherein
20 said compound thin film is composed of a gallium nitride (GaN) thin film having a $(11\bar{2}0)$ surface as its top surface.

60. A fabrication method of a thin film device comprising the steps of: epitaxially growing metal sulfide on a single
25 crystal silicon substrate by feeding molecular metal sulfide on the single crystal silicon substrate under a reduced pressure; and epitaxially growing a compound thin

film with ionic bonding on the metal sulfide.

61. A fabrication method of a thin film device comprising the steps of: epitaxially growing metal sulfide on a single
5 crystal silicon substrate by feeding molecular metal sulfide on the single crystal silicon substrate under a reduced pressure; and epitaxially growing at least two compound thin films with ionic bonding sequentially on the metal sulfide.

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62. A fabrication method of a thin film device comprising the steps of: epitaxially growing a metal sulfide layer on a single crystal silicon substrate by feeding molecular manganese sulfide on the single crystal silicon substrate
15 under a reduced pressure; epitaxially growing an aluminum nitride (AlN) layer having a $(11\bar{2}0)$ surface as its top surface; and forming on said aluminum nitride layer a gallium nitride (GaN) thin film having a $(11\bar{2}0)$ surface as its top surface.

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63. A fabrication method of a thin film device comprising the step of sequentially stacking a metal sulfide layer epitaxially grown on a single crystal silicon substrate, and at least two compound thin films with ionic bonding,
25 which are epitaxially grown on said metal sulfide layer.

64. A fabrication method of a thin film device comprising

the steps of: forming a metal sulfide layer on a single crystal silicon substrate by epitaxial growth; forming a platinum group layer on said metal sulfide layer by epitaxial growth; and forming a compound thin film ionic bonding on
5 said platinum group layer by epitaxial growth.

65. The fabrication method of a thin film device as claimed in claim 60, wherein said compound thin film is composed of a metal nitride thin film.

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66. The fabrication method of a thin film device as claimed in claim 61, wherein said compound thin film is composed of a metal nitride thin film.

15 67. The fabrication method of a thin film device as claimed in claim 63, wherein said compound thin film is composed of a metal nitride thin film.

68. The fabrication method of a thin film device as claimed
20 in claim 64, wherein said compound thin film is composed of a metal nitride thin film.

69. The fabrication method of a thin film device as claimed in claim 60, wherein said compound thin film is composed
25 of a metal oxide thin film.

70. The fabrication method of a thin film device as claimed

in claim 61, wherein said compound thin film is composed of a metal oxide thin film.

71. The fabrication method of a thin film device as claimed
5 in claim 63, wherein said compound thin film is composed of a metal oxide thin film.

72. The fabrication method of a thin film device as claimed
10 in claim 64, wherein said compound thin film is composed of a metal oxide thin film.

73. The fabrication method of a thin film device as claimed
in claim 60, wherein said compound thin film is composed of a metal sulfide thin film.

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74. The fabrication method of a thin film device as claimed
in claim 61, wherein said compound thin film is composed of a metal sulfide thin film.

20 75. The fabrication method of a thin film device as claimed
in claim 63, wherein said compound thin film is composed of a metal sulfide thin film.

76. The fabrication method of a thin film device as claimed
25 in claim 64, wherein said compound thin film is composed of a metal sulfide thin film.